Electricity Quality of Supply Experiences of Large Customers

A Survey conducted by Marsden Jacob Associates
for Energy Users' Association of Australia

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TABLE OF CONTENTS

Page

1. Introduction

This report presents the findings of a survey of quality of electricity supply experiences of large commercial customers in Victoria. Marsden Jacob Associates (MJA) for the Energy Users Association of Australia (EUAA) conducted the survey to inform the Essential Services Commission (ESC).

The Survey has also been supported by a grant from the National Electricity Consumers' Advocacy Panel and their assistance is also gratefully acknowledged.

2. Background

Service quality is a key factor in electricity supply and the most important issue - apart from price - that is of interest to electricity users. The Distribution Code, which is overseen and approved by the ESC, is the primary regulatory instrument that influences technical standards of service and supply quality in Victoria.

The Distribution Code formally summarises and consolidates the range of technical Standards and industry Codes of Practice that impact on outcomes arising from the way the distribution system was (and is) constructed and operated. It also specifies minimum standards of performance that the electricity distributors (DBs) are required to meet. However, the actual standard of performance required of the DBs is not absolute. The DBs are required to use 'best endeavours' to achieve 'good industry practice'; and no DB has ever been penalised by the ESC for a breach of its obligations under the Distribution Code.

Over for the past five year regulatory period, the DBs have had access to incentive payments if they were able to beat supply performance targets established by the Office of the Regulator-General (ORG) in the 2000 electricity distribution price review. These arrangements were also intended to be 'fair' to energy users in that the DBs also faced a penalty if they did not meet the targets. The arrangements were intended to provide an additional stimulus for DBs to at least maintain, and if possible, exceed the minimum obligations specified in the Distribution Code. This aspect of the regulatory regime was termed the 'S-Factor' incentive by the ORG. A detailed explanation of the scheme devised by the ORG - including the complex algebraic formula used to calculate the DBs' annual price adjustments - is provided in Appendix D of the ORG's 2000 Final Determination.[1]

The existing 'S-Factor' scheme has little to commend it to large electricity users (and, possibly, small consumers). The key measures of performance linked to the 'S-Factor' incentive payments relate to supply reliability performance, with the greatest weight given to reducing the impact of unplanned outages and lesser weight to planned average minutes off supply. The focus is on system wide performance and the impact on average outcomes or 'average' end users. No weight is given explicitly to the economic/financial impact of

[1] The 'S-Factor' incentive scheme is supplemented by a Guaranteed Service Level payment scheme that provides nominal financial compensation to small consumers who experience bad service, an 'appliance damage' scheme that compensates (uninsured) small consumers whose electrical appliances are damaged by severe voltage variations – and by a public performance reporting regime that is intended, in part, to 'embarrass' poorly performing DBs.

service quality; no account is taken specifically of the impact on end users involved in productive use of electricity; and events that are deemed (by ORG/ESC) to be beyond the control of the DBs are excluded. This means that the DBs are able to gain a benefit from the 'S-Factor' incentive scheme even when end-users experience planned outages or 'events beyond the control of the DBs', which amongst other things may include strong storms, perambulatory possums, cremated crows and drunk drivers that out supply to Zone Substation feeders (or dedicated consumer feeders).

A further drawback of the existing S-Factor scheme (for consumers) is that it is impossible to determine what the cost of the existing S-Factor scheme has been. This is because the reward/penalty mechanism implemented by the ORG changes the value used in the "tariff basket" price-setting formulae. It is not possible to work out how much any DB is paid (or forfeits) in any one year or in the regulatory period. Whatever the amounts are, they are incorporated into the differences between forecast and actual revenues on a year-by-year basis.

Despite its limitations, there are indications that the incentive scheme has been effective in focussing the DBs on service standards. For example, the simplest measure of supply reliability performance SAIDI[2] has improved somewhat in the current regulatory period, (except for TXU), which is a significantly better service outcome than achieved by distributors in NSW and Queensland over the same period. Accordingly, the ESC has confirmed that it proposes to continue the 'S-Factor' scheme for the next five years, but has indicated interest in reviewing the basis of the scheme.

3. Customer Survey

The quality of supply review contained in this report is intended to provide input to the ESC's considerations based on factual information on supply quality issues of concern to EUAA members. It is also intended that the report present this information in a form that will be both useful to the ESC and that could influence any changes that the ESC might contemplate for the 'S-Factor' scheme.

The types of information that was considered to be particularly relevant in this survey were:

- Historical data of the number of events, type of events and, if possible, cause of the event.
- Continuous time series data going back 5 or 10 years (or longer) was considered to be highly desirable. This would be most effective in demonstrating any generic deterioration of supply quality.
- The cost of each event to the business.
- Who the user dealt with to resolve or clarify responsibility and/or remedy for the event (Retailer and/or DB).

[2] System Average Interruption Duration Index, which is the total minutes, on average, that a customer could expect to be without electricity in a year due to interruptions (of duration equal to or longer than one minute).

- The type and quality of support offered by the DB in dealing with the event, including timely response, offer solutions to overcome similar future events, potential of demand management solution etc.
- Willingness of user to pay for upgrade and/or augmentation of system to improve quality of supply.
- Any views on whether DBs should be reimbursed for upgrade and/or augmentation via a capital allowance or rewarded via the 'S-Factor' scheme.
- If user has had new equipment installed; what has been the willingness of the DB to assist the user with electricity supply reliability for the effective functioning of the equipment.

In addition, the EUAA executive suggested that MJA simultaneously collect information related to annual tariff adjustments. In particular, it was considered to be useful to obtain an indication of any differences in forecast annual expenditure that are due to unanticipated changes to tariffs and the actual tariff charges.[3]

MJA contacted nominated representatives of 13 large electricity users with operations in Victoria, who had been identified by the EUAA. All were EUAA member organisations. Of these, 9 were eventually able to provide comments and/or site-specific technical data to assist interpretation of the survey. The remainder were either unable to provide information that was site specific or were unable to provide a contact person located in Victoria who could provide detailed information in the period of the survey.[4]

The customer representatives nominated by the EUAA generally had corporate responsibility for energy purchases for multiple sites, several for national corporations with many sites across Victoria and Australia. In most cases, the initial contact person assisted by identifying individual site managers or power electrical engineers who were able to provide detailed technical responses. MJA undertook a series of interviews, principally by telephone, to establish the quality of supply experiences of each customer and gather any data relevant to those experiences.

The large users were asked to provide, if possible, documents to support comments made in the interviews that could be made available to the ESC – on a 'commercial-in-confidence' basis if necessary. As noted above, particular attention was focussed on seeking information that related to the financial (or production) impact arising from poor quality of supply performance. This was considered to be of both relevance and importance given the ESC's

[3] Information provided to the respondents listed each of the items of interest to the EUAA. Only one respondent specifically raised issues related to cost. This was in respect of the impact of United Energy's time-of-use tariffs that incorporated a Summer Demand Incentive Charge (SDIC). The SDIC imposes higher costs during the period October to March inclusive that are slightly more than offset by charges in during the April to September period. Overall, this respondent's total energy bill was around 3% lower with the SDIC, which the respondent considered satisfactory.

However, this does not mean that large end-user organisations are not concerned about the impact of unexpected changes in tariff amounts. Several other respondents advised that energy-purchasing arrangements were managed by specialist procurement managers off site. The technical contacts at the respondents' sites were involved in production activities that were, typically, separated from energy procurement.

[4] Not surprisingly, all persons contacted for the survey were busy people, and most had other substantial responsibilities to their organisations apart from energy.

intention to focus on commercial incentives in the proposed 'S-Factor' scheme that were intended to stimulate improvement by DBs of quality of supply outcomes.

MJA emphasised that the ESC would be inclined, and be better able, to specifically address issues identified in the survey if could be supported by 'hard' evidence. However, although all 9 customers who provided responses in the interviews referred to detailed records of outages and quality of supply difficulties, few were prepared to provide copies of this information to MJA. A primary reason for this appeared to be concern about the possible impact on the customers' business operations that might arise if quality of supply issues at a particular site became public. A number of respondents referred to the potential for their own customers becoming concerned about the respondents' ability to meet production commitments if the respondent's concern (or experience) of quality of supply became known.

MJA recognises that lack of site specific and detailed evidence may be seen by the ESC to reduce the value of the survey results. However, while care has taken care not to disclose specific details of an individual respondent's location or operations, MJA has attempted to place the information obtained from the survey into a context that would be of maximum use to both large customers and the ESC.

3.1. Quality of Supply – Large Customer Experiences

The survey revealed several findings that have significance both to large customers experiencing quality of supply issues, and also to the current and future regulatory environment. Unsurprisingly, quality of supply was an important consideration to all respondents. However, despite most respondents experiencing some quality of supply issues, experiences varied significantly. Improved supply quality was often linked to the allocation of resources within the respondents' organisations, establishment of systems designed to track and respond to supply problems and access to data that could be collected from advanced interval meters typically installed at the respondent's site.

Apart from frequency and duration of outages, line losses were also an important issue to some respondents. Frequency variation was also an issue with some customers. Those customers using continuous processing machinery were most susceptible to outages even of very small duration.

In some cases, 'excluded service' augmentation was paid for by customers in an attempt to improve quality of supply. However, despite customers expressing satisfaction at the improved outcomes this investment provided, each respondent reported that it was not possible to 'negotiate' an associated guarantee that quality of supply would be maintained at the level achieved by the 'excluded service' augmentation. Several respondents agreed with MJA that this might be paraphrased on seeking to achieve a 'property right' over result of the augmentation investment, with the DBs held accountable for ensuring that quality supply did not deteriorate below the level achieved by the respondent's investment.

These points suggest that there is scope within current regulatory arrangements for all large customers to achieve resolution of quality of supply problems through establishing a more proactive and assertive relationship with both retailers and distributors. It also suggests, however, that current regulatory processes could be improved by clarifying the obligations of DBs in respect of 'excluded service' augmentations. The structure of this paper outline

concerns and issues raised by large customers, address their responses to these concerns, and analyses the implications both for large customers and the regulatory process.

3.2. Concerns

In terms of power requirements, the importance of electricity quality of supply is second only to price for most large customers. Continuously processing machinery and computing systems are often extremely sensitive to supply dropouts, even of very small duration. This problem can be aggravated for some customers because computers and machinery installed in their plants is more sensitive to voltage variability than the Distribution Code allows.

The most common concern expressed was of outages and severe voltage fluctuations, especially for customers operating continuous process plants. A short outage, or large voltage fluctuation can result is large costs associated with restarting processes that affect the entire business, as well as labour costs for electrical specialists who must go 'offline' to rectify these problems. In some cases there were also losses associated with the output of the enterprise being ruined by a pause in production (examples quoted were a plastic bag extrusion plant and chemical production plant). Most respondents reported that they had installed protection systems and/or Uninterruptible Power Supplies (UPS) on 'process critical' equipment, typically production control system computers in an attempt to minimise the risk of catastrophic damage that might occur from quality of supply problems.

Each of the respondents that operated a continuous process plant that was sensitive to interruption was able to provide estimates of financial losses that accompanied supply interruptions[5]. However, there is no doubt that large electricity users incur significant financial costs associated with imperfect quality of supply.

One respondent reported that a recent series of short outages over a period of 6 months had cost more than the total network charges paid during that period. The respondent found it particularly irritating that these outages followed a significant investment in 'excluded service' augmentation involving installation of a dedicated supply to the respondent's plant from the nearest Zone Substation that had subsequently been used by the local DB to connect a new customer. When asked to explain the outages the DB reported that all fell into the category of being 'beyond the control of the DB', although the respondent suspected that at least some had occurred because the new customer had been connected to the asset paid for by the respondent that the DB considered to be a 'shared asset'.

Another respondent reported continuing occurrence of repeated outages (between 3 to 6 per year) at a three-year-old new plant connected to a new Zone Substation in an newly established industrial zone that was less than 5 km from the nearest transmission Terminal Station. The respondent's plant was connected to a dedicated supply less than 1 km from the Zone Substation. In MJA's view this constitutes a very favourable arrangement for achievement of quality of supply outside of the Melbourne CBD. However, when asked to explain the outages the DB reported that all fell into the category of being 'beyond the control of the DB' and included possums, birds and car crashes that had occurred on the 66kV feeders between the Terminal Station and Zone Substation. The ESC should be

[5] However, for commercial reasons respondents preferred that such information remain confidential.

concerned that this is the best that any of the DBs might be prepared to achieve under near ideal conditions where concentrated loads of high economic value occur in close proximity to major electricity infrastructure.

These examples demonstrate why quality of supply was a concern to all respondents contacted by MJA.

Another important concern related to voltage variability. Some particular machinery and computing systems are extremely sensitive to sudden changes or 'steps' in voltage, which can cause them to shut down as a result. A potentially worse, but nonetheless realistic scenario faced by some respondents is that an unanticipated outage or severe voltage variation could contribute to cascading trips capable of causing large amounts of equipment damage.

A third quality of supply concern related to increasing line losses in recent years, and the inability of large users to prevent broader system line losses from accruing over time. One respondent reported that the cost of line losses passed through by the retailer had increased three fold over the last 5 years and now constituted a significant part of the total bill. This respondent operated a plant that was the first load on a circuit, but losses over the whole system had increased and averaging of these loses all customers (on the same tariff) had disproportionately affect their energy costs even though their energy consumption remained unchanged. Again, the inability to negotiate site-specific terms for quality of supply left this large user with little leverage.

3.3. Responses

Whereas all large customers had concerns about quality of supply, there was a large variation in responses to these concerns. Although they occurred over a spectrum, responses to quality of supply concerns can be grouped into three broad categories: those who were less proactive; those who were more proactive, but inadequately resourced; and those who were proactive and positively assertive, and adequately resourced.

Those customers who were more proactive in response to their concerns employed several strategies. The most common was that they had established systems to record details of supply quality incidents when they occurred, and immediately contacted their DB and retailer for explanation. Some were more systematic than others, but those that were more systematic appeared to receive more satisfaction from DB explanations than those who were less systematic. For example:

- Several respondents, designated by MJA as being '*proactive and positively assertive, and adequately resourced,*' reported that they had systems in place that included recording of events (and their impact) and contact with both a designated DB and retailer representative. These included both large-site operations with devolved responsibility for energy supply and smaller single site entities. They may still have single corporate-wide energy procurement but the retailer had been required to participate in the information-feedback loop as a 'value-added' service.

  One of these respondents reported that they did not consider quality of supply to be a significant issue for the business, and the few short-term issues that did arise did not create significant costs for the business. But MJA noted that this was a very large

industrial operation that did not include continuous production processes as a major activity. The site was also a long-established major manufacturing facility relatively close to transmission assets. MJA has noted that a number of such sites across Victoria had established very high quality of supply arrangement through 'negotiation' with the SECV and Government prior to privatisation of the electricity sector.[6]

- Several respondents, designated by MJA as being '*proactive and assertive, but inadequately resourced*' reported that they had established systems in place that included recording of events (and their impact) and contact with a designated DB representative; but they did not include their retailer in the information-feedback loop because energy purchasing arrangements were handled on a corporate wide basis through the head office. One particular corporation operated more than 200 sites, of varying sizes, across the country and had negotiated a single energy supply contract based on the lowest energy price. The respondent advised that there appeared to be little point in including the retailer in the information-feedback loop because the information would have to be relayed through head office and the retail contact would be of little value in the dialogue with the DB – even if they did bother to respond.
- Several respondents, designated by MJA as being '*less proactive*', reported difficulty in dealing with supply quality issues because their organisation was not sufficiently large to dedicate the resources required to routinely document supply quality issues or to follow up every event with DBs.

It was of considerable interest to MJA that, although some respondents reported poor ongoing customer relations from their DB, several suggested that the DBs had improved their response to quality of supply complaints over the last five years. This was particularly pleasing as MJA was aware that some large customers had reported very unsatisfactory responses prior to 2000.

It is also of considerable interest to note that at least two large customers have 'bypassed' the DB networks since 2000. Information posted on the VENCorp Website shows that Air Liquide is now directly connected to the Altona Terminal Station and the Perseverance Mine site at Fosterville is connected to a dedicated sub-station supplied from the Shepparton-Bendigo transmission line.[7] These outcomes, combined with the ORG's 2000 Decision to issue an 'inset' Distribution Licence to Powercor to distribute electricity in the Docklands precinct, suggest that the DBs can be 'encouraged' to be more customer focussed. These examples also reinforce the benefits that customer can negotiate if they have 'real' alternatives (bypass).

However, despite the reported improvement in DB responsiveness to quality of supply issues raised by customers, a common problem associated with DB explanations for supply quality

[6] For example, MJA is aware that Toyota 'negotiated' a virtually interruptible power supply arrangement as a pre-condition for investment in the plant at Altona, which was commissioned in the mid-1990s. MJA understands that the Toyota Altona supply arrangements include feeders from both the Brooklyn and Altona Terminal Stations to a computer controlled sub-station at the Toyota site that is capable of switching feeder inputs in milliseconds. Advice provided by Toyota to Dr Jeff Washusen in the late 1990s was that the biggest single supply quality problem that had been experienced in the first few years of operation was the need to re-program the robotic spray line so that the spray painting cycle continued if interrupted.

[7] Information on both these arrangements is posted on the VENCorp Website and on the Powercor Website for the latter. MJA notes that the Perseverance sub-station was constructed by SPI Powernet and Powercor, presumably as an 'excluded services' augmentation. It is not clear which entity will own the assets.

issues was that the actual cause of the event, and where it originated from, was difficult to establish. This was common across all respondents. In response to this uncertainty, some more proactive customers have insulated their system as far as possible (at significant financial cost) to reduce the frequency of incidents on their side of the connection point. This adds authority to complaints and appears to have contributed to a better working relationship with their DBs.

Most respondents kept consistent and sometimes detailed logs of supply quality incidents. Most assigned this task to trained electrical specialists employed at each operating site. Several respondents had made arrangements with the Meter Data Agent to access 'Smart Meters' that were capable of collecting sophisticated data relating to dropout frequency and duration, as well as voltage data. This data collection facilitated discussion with the DBs. As noted above, those who did not keep detailed logs often suggested a lack of resources were the main reason for this.

Some customers not only insulated their systems internally as far as practicable, but the financial costs of supply incidents were so great that paying for DB to augment infrastructure through 'excluded service' agreement became financially feasible and efficient. Some respondents had paid for significant upgrades to infrastructure involving, for example, separate transformers at substations and construction of dedicated supply lines. Importantly, some respondents expressed concern (or frustration) at not being able to establish any form of assurance (or guarantee, or as MJA termed it 'a property right') that the DB would maintain the quality of supply achieved by this investment. The issue of who might access assets paid for by respondents was also a concern. Customers did not appear to own the infrastructure, nor could they gain exclusive access to it through 'excluded service' agreements. Despite the financial investment, no guarantee was achieved that the improved quality of supply would be maintained. Although it should be noted that customers who undertook these practices reported improved supply quality, concern was raised about future supply quality as no guarantees were given.

No respondents reported discussing or negotiating for quality of supply guarantees with DBs in their initial connection agreements. Cost was the overwhelming topic of initial and ongoing negotiation.

4. Implications

The findings of this preliminary study suggest implications both for large customers, as well as the ESC in its regulatory activities.

4.1. Implications for Large Customers

A clear implication of large user experiences outlined here is that there is scope to improve quality of supply outcomes within the current system, but not without some cost to the customer. The experiences summarised above suggest that a more proactive, assertive and systematic approach to supply quality issues can result in improved outcomes. Options that may assist include:

1. recording and detailing supply quality issues systematically;

2. routinely accessing whatever power quality data is recorded in the customers' 'Smart Meter';

3. developing a formal system of interaction with DBs and retailers following every supply quality incident;

4. developing a robust and assertive relationship with a relevant DB customer relations representative;

5. insulating critical systems and machinery from internal faults and major external interruptions (to decrease incidents and increase certainty of fault origin); and

6. where necessary and efficient, negotiating 'excluded service' arrangements to improve supply quality outcomes through augmentation of infrastructure on the DB side.

While these options may not be effective in every case, the clear indication from this survey is that 'the squeaky wheel gets the oil'. Several customers reported improved attention to customer relations on behalf of their electricity providers in recent years, and as a result, there appears to be more scope for greater dialogue between customers and providers. However, the final point above has an important regulatory importance.

4.2. Regulatory Implications

The ESC has implied in previous decisions that large customers have sufficient market power to negotiate improved electricity service outcomes. Although negotiating with an organisation with natural monopoly powers will always be difficult, some of the experiences outlined above suggest that improved outcomes can result from this process. However, some regulatory oversight and attention of changing practices is required to guarantee optimal and efficient outcomes.

The practice of customers financing new or upgraded infrastructure on the DB side of the connection point is not new, however given the new regulatory environment overseen by the ESC, it raises important regulatory questions. Essentially, if a customer is prepared to pay for infrastructure on the DB side of the connection point to ensure an improved quality of supply, they should be entitled to either exclusive access to the infrastructure they purchase, or a guarantee of the quality of supply they are financing. This would ensure that both the customer and the DB make efficient investments. The current regulatory environment ensures neither of these outcomes and this needs to be addressed.

There appears to be large scope for data collection from customer meters. Several companies reported using 'Smart Meters' which are capable of gathering detailed quality of supply information. However, due to the lack of arrangements for quality of supply indicators with DBs, detailed data is often not collected and analysed. This is also a resource constraint. However, for future regulatory undertakings, there is scope for this data to be accessed and more fully used.

In addition, MJA believes it is important to note that some respondents report continuing difficulties even where the physical conditions (high loads, concentrated areas and proximity to major infrastructure) suggest high levels of performance could be achieved with efficient investment by the DBs. This suggests that the ESC should review is proposals for the 'S-Factor' incentive scheme to ensure that it also provides clear incentives for DBs to make efficient investments in network infrastructure that supplies economically productive electricity users.

MJA did not have access to sufficient resources to 'unravel' and understand the interactions and possible impacts of the very complex 'S-Factor' formulae proposed by the ESC. It is, therefore, not possible to make any specific recommendations that might achieve the objective outlined above. This is a task that can only be effectively undertaken by the ESC and we urge the ESC to do so as part of its Final 2006-2010 Price Determination for the Victorian Distribution Businesses.

The difficulties experienced by large consumers means that the ESC should do more to provide information that would enable consumers, individually or collectively, to negotiate effectively with DBs. The ESC should implement changes to regulatory instruments to establish an enduring guarantee (or property right) that would require the DBs to maintain service standards at the level achieved through the excluded service arrangement; and require DBs to recognise the value (in the excluded service agreement) created for others through excluded service augmentation. This could be achieved by modifying existing Guidelines to enable negotiation over such matters on a more level playing field and provide for disputes/delays to be resolved by the ESC.

5. Conclusions

The comments by large Victorian electricity customers summarised in the report do suggest interesting implications, both for large customers and also for the regulatory environment.

For large users, the major implication is that a structured, proactive and assertive approach by customers can receive better quality of supply outcomes from DBs. There is some suggestion that DBs are becoming more receptive to customer service than previously, and that a systematic approach to this relationship can improve reliability measures. This outcome will be supported by detailed data collection from the customers' 'Smart Meters' and investment in infrastructure on the customer side of the connection point that acts to protect critical systems and plant. There is also scope for investments on the DB side of the connection point. However, the current regulatory environment is at present unable to adequately protect the benefits that customers might gain through this investment.

The protection of investments made by customers on the DB side of the connection point is the most important regulatory implication of this survey. Those customers who make efficient investments in DB infrastructure are entitled to either exclusive access to this infrastructure, or to a guarantee of the supply quality it finances. The ESC should implement changes to regulatory instruments to establish an enduring guarantee (or property right) that would require the DBs to maintain service standards at the level achieved through the excluded service arrangement; and require DBs to recognise the value (in the excluded service agreement) created for others through excluded service augmentation.